Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

SWEET CLOVER

Leaflet No. 23

rev. Oct. 1939

U.S. Department of Agriculture

SWEETCLOVER

By A. J. Pieters, *agronomist, Division of Forage Crops and Diseases, Bureau of Plant Industry* [1]

Sweetclover is one of the important forage crops of the northern United States and Canada today, whereas 30 years ago in some States it was considered a weed. Sweetclover is a legume, and, like other legumes, if it is inoculated, can use atmospheric nitrogen, which other farm crops such as corn, grain, and potatoes cannot use. A good crop of sweetclover may contain 100 or more pounds of nitrogen per acre. This, with its large yield of organic matter, makes it one of the best soil-improvement crops. Annual and biennial forms occur, and these permit a wide use in rotations.

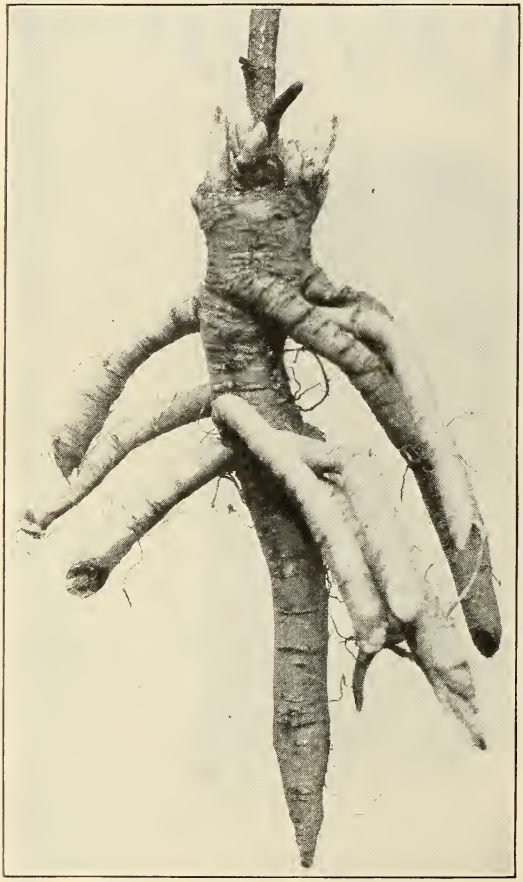

Figure 1.—The buds on the crown carry the plant over winter.

The forage is high in protein and makes an abundance of pasturage.

In regions of low rainfall sweetclover is used for hay, but in the more humid States difficulties encountered in making a high-quality hay limit its use for this purpose. The use of sweetclover for silage is increasing, and this practice offers an opportunity for preserving the green forage when conditions make harvesting for hay impossible.

Growth Habit

The habit of growth of sweetclover varies. The annual sorts, yellow and white, make all their growth in one season, mature seed, and die. The biennial, white and yellow, make from 10 to 24 inches of growth the season of seeding, depending upon moisture and soil conditions. From midsummer to early fall buds are formed on the crown of the roots (fig. 1). These buds remain dormant over winter and

[1] Revised by E. A. Hollowell, senior agronomist.

157661°—39

Issued May 1928
Revised October 1939

produce early the next season a strong growth of stems from the crown. (See illustration on title page.) If allowed to grow, the second season's growth of biennial white commonly attains a height of 4 to 5 feet, but on good soil it may grow 8 to 10 feet high and make a veritable jungle.

When the second season's growth is cut in June or late May the new growth does not come from the crown, as in alfalfa, but from dormant buds on the lower portions of the stem. If cut too low, the plants die. At the end of the second season, growth is completed, seed is produced, and the roots and tops die.

Where it Will Grow

Sweetclover will grow almost anywhere, provided there is more than 17 inches of rain suitably distributed and sufficient lime in the soil. It is very resistant to cold and drought and is not troubled by heat. Good sweetclover may be found anywhere in the United States, except where the rainfall is too scant or the soil is sour. Sweetclover is able to obtain phosphorus from relatively unavailable soil phosphates and consequently will grow on soils where alfalfa or red clover requires phosphate fertilization. Sweetclover will thrive in soils too high in alkali for alfalfa, or, in fact, for most cultivated crops.

It Needs Lime

Lime provides available calcium, which is one of the elements that sweetclover needs and which is generally lacking in soils of the humid States. This is doubtless one reason why sweetclover has made greater advances west of the Mississippi River than in the East. Such soils low in calcium are commonly called sour or acid soils. Unless lime in one form or another is applied to such soils efforts to get good stands and growth of sweetclover are wasted. Depending upon the degree of acidity, applications of from 1 to 4 tons of ground limestone per acre are generally made. On many moderately acid soils, however, the use of 300 to 700 pounds per acre of finely ground limestone (of which 75 percent will pass through a sieve with 100 meshes to the inch) mixed and drilled with the seed has given good stands of sweetclover. Lime may be applied by broadcasting on the surface and for best results should be worked into the seedbed. Many farmers follow the practice of applying limestone before plowing. The subsequent disking and harrowing tend to distribute it through the topsoil, though with deep plowing it may be placed too deep to be most effective.

How to Get a Stand

In spite of the fact that sweetclover is a hardy plant, it is not always easy to get a stand. Three things are especially important in this connection—lime, inoculation, and a firm seedbed. The need for lime has been mentioned.

Though sweetclover can and does take nitrogen from the soil, it seems peculiarly dependent on the root nodules for most of its nitrogen, and this is especially true on poor soil. If properly inoculated approximately two-thirds of the nitrogen of the plant is obtained from the air. The bacteria that cause the plant to produce these nodules are

the same as those that inoculate alfalfa, and hence wherever alfalfa is naturally inoculated sweetclover will be inoculated. This is the case quite generally west of the Mississippi River, but in the East inoculation should be provided wherever alfalfa or sweetclover have not been grown before.

A firm seedbed is necessary. Many failures have been shown to be due to a lack of rolling and compacting after plowing. When sweetclover follows a cultivated crop, light surface disking is usually enough; but when the land is freshly plowed it must be well packed and surface-worked before it is seeded to sweetclover. Sweetclover is very commonly seeded on winter grain, and in such cases the seedbed is compact enough. When it is seeded with spring grain on newly plowed land, compacting should be well done.

Kind of Seed and How Much to Use

Seeding may be done with unhulled seed, hulled seed, or scarified seed. The last-named kind is hulled seed that has been specially treated to scratch or break the hard seed coat. Such seed germinates more promptly and evenly than unscarified seed and has been commonly recommended for spring seeding. If unscarified seed is used in the spring, the stand is likely to be thin, because the hard seeds do not sprout promptly. When scarified seed of good germination is used, 12 to 15 pounds to the acre should be enough, and on the drier lands of the West, 10 pounds will be better. When unscarified seed is used, 25 to 40 pounds should be seeded.

When to Seed

Spring seeding is most commonly practiced, but late fall seeding or even winter or very early spring seeding with unhulled seed may give very good results. The unhulled seed is cheaper than the scarified, and a more liberal seeding with it is justified. When such seed is used, seeding should be done so late in the fall that the seed cannot germinate before spring. The action of moisture and frost breaks the seed coat, and the seed is ready to sprout with the first warm weather. An early start is important, since the young plants grow best in cool moist weather and are then less troubled with weeds. For seeding in April or later, scarified seed should be used.

How to Do Seeding

Seeding may be done with a clover drill or with a grain drill having a grass-seed attachment, or the seed may be broadcast by hand or by any one of the broadcast seeding machines. When seed is broadcast in spring the field should be harrowed to cover it. When seeding is done in late fall or winter no further treatment is necessary. On light soil the seed should be placed about 1½ inches deep, but on heavy soil not over 1 inch and better about one-half inch.

Companion Crop

The object of a companion crop is not so much to help along the clover as to get an extra crop from the land and incidentally to keep down weeds. On weedy land and where moisture is sufficient for two crops a companion crop is useful. In the dry-farming regions of

the West a companion crop should not be used, as it becomes a robber crop, taking the moisture the young sweetclover plants need. In the Great Plains States drilling the seed in wheat, Sudan grass, or sorghum stubbles has given the best stands.

Wheat and oats are the common companion crops, and early oats are better than late varieties. Barley, because of its early maturity and open growth, is an ideal companion crop. Field peas are often successfully used in the Northwestern States. Sweetclover may be seeded on or with any of the small grains; but where the grain is thick or lodges, the clover is sure to suffer. Sweetclover has also been successfully seeded in corn at the last working, but only where corn does not grow very rank or where the rows are widely spaced.

Kinds of Sweetclover

The sweetclovers belong to the genus *Melilotus*, and in the United States and Canada four species and one botanical variety are used. There are also agricultural varieties of two of the species. Biennial white (*Melilotus alba*), biennial yellow (*M. officinalis*), (*M. suaveolens*), and annual yellow (*M. indica*) are the species, and Hubam (*M. alba annua*), an annual variety of the biennial white, is the botanical variety.

The annual yellow, commonly called bitter or sour clover, is useful only in the Gulf States, in the Southeast, and as far north as South Carolina and in the irrigated sections of California and Arizona. It is a winter annual, and where it does well it is a valuable cover and green-manure crop. Occasionally it is also used for pasture and for hay. In the North it has no value.

The biennial white and the biennial yellow fill similar places in the agriculture of the North, but the yellow is more slender and lower growing, inclines to be more prostrate, and will tolerate more adverse conditions, such as drought and close grazing or cutting. It will not give as large a yield as the white and is earlier in maturity, thereby reducing the grazing period of the second year. Redfield, a biennial yellow flowering variety of *Melilotus suaveolens*, is late in maturity and seems to be particularly adapted to sections of the northern Great Plains States.

The Hubam is an annual white, resembling the biennial white in appearance but making no resting buds and producing seed the season of sowing. When a catch crop is wanted, especially when the field is to be fall-plowed, it is useful.

Other species and varieties of sweetclover are now under trial but are not yet upon the market.

Utilization

The greatest value of sweetclover is for pasture and soil improvement. Except in the dry regions the difficulties experienced in making a good-quality sweetclover hay limit its use for that purpose.

Pasture.—No other plant is known that will furnish as much grazing under as wide a range of conditions as a good stand of sweetclover in its second season. The first season's growth may be grazed from the time it is 8 to 10 inches high until frost, and the second season's growth may be grazed from early spring until the plants are too woody to be palatable, which is usually about the end of July. The

first year's plants should not be closely grazed, for such a practice may weaken them, thereby reducing the second year's growth, or the stand may be lost by winter-killing.

The second year's growth of sweetclover is hard to keep down; cases are known where three or four head of mature cattle per acre did not keep the clover down completely, but these are of course exceptional. If late-maturing varieties are used and properly grazed, the cattle can be moved from the old sweetclover to the young stand, or at least with a very short interval of feeding between. Under dry conditions it is seldom possible to graze the first year's growth, but, where soil and moisture conditions are favorable, stands will carry about one-third to one-half the cattle that can be put on the second year's growth.

It is important that enough stock be put on the second year's growth to keep it down, for if this is done the clover keeps on pushing out new growth; if it is not done, the clover blossoms, gets woody, seeds, and dies.

Hogs, cattle, horses, and sheep may all be pastured on sweetclover. It is sometimes said that cattle will not eat it. The answer is that thousands of cattle do eat it every year and relish it. The secret of success is in turning the cattle on the clover early, when it is 6 to 8 inches high and tender.

There is less danger from bloat with sweetclover than with alfalfa or red clover, but the danger exists and should be guarded against; keeping hay or straw available to stock will help, as will a good feed of dry fodder before the cattle are turned on the pasture. Some farmers have no trouble with bloat when cattle are left on the sweetclover day and night. However, some care should be exercised with livestock pasturing sweetclover as when they are pasturing any other succulent legume.

Soil improvement.—It is hard to say whether sweetclover is more valuable for pasturage or for soil improvement. It is an excellent crop for both purposes, and fortunately both ends can often be attained at the same time. In some sections it has been found that the increased yields of sugar beets due to sweetclover were practically the same when the crop was pastured and what was left turned under as when the entire crop was turned under.

The value of sweetclover as a soil improver lies in its ability to take nitrogen from the air through the nodules on the roots, to store this in its thick root and in the stems and leaves, and to deliver it by rapid decay when it is turned under. Much if not most of the nitrogen in the top growth of the first season moves into the roots in the fall and is stored there. The new growth in the spring is made from this stored nitrogen, and in April and early May, as the nitrogen in the tops increases, that in the roots decreases. This feature and the fact that it starts growth very early make sweetclover an ideal green manure for corn. In addition to the plant food made available for the use of the following crops, a large growth of sweetclover turned under increases the organic-matter content and improves the tilth of the soil.

It is not necessary to wait for a large spring growth before turning sweetclover under; usually there will be no more nitrogen May 15 than there was April 15, and the field can be plowed just as soon as plowing can be done after a few inches of growth have been made to

insure that the tops will die and not come up in the corn. If dry weather follows the turning under of sweetclover in late spring, poor stands of the succeeding cultivated crops, such as corn, frequently occur. Rotations of corn and oats with sweetclover in the oats are now common, the sweetclover being turned under for the next crop of corn. Increased yields of from 10 to 20 bushels of corn per acre or even more have resulted from this practice.

Sweetclover is sometimes plowed down in the fall of its first season, but there is always danger that the resting buds will not die but will make a heavy growth the next season. Fall-plowed first-season

FIGURE 2.—The plant at the right was cut 10 days earlier than the one at the left. The former made new growth; the other died.

sweetclover should never be followed by small grain, as the farmer may have more sweetclover than grain. For corn, if the plowing is carefully done and the ground well-prepared by disking in the spring, fall plowing of sweetclover may be successful.

Hay.—As a hay crop sweetclover is not equal to alfalfa or red clover. Occasionally when the first season's growth is 18 to 24 inches high and late fall weather is favorable for curing, good sweetclover hay can be made. Except in dry regions the sappy, coarse stems of the second year's growth are most difficult to cure. Furthermore, sweetclover must be cut at the right time. This usually conflicts with the planting of other crops, and frequently rainy, cool weather prevails. The common result is a heavy loss of leaves and coarse stemmy or moldy

hay. The latter is dangerous to feed, as it is often toxic. Many cases are on record of cattle having been killed by eating moldy sweetclover hay.

The height at which it is safe to cut the spring growth will vary with the age and thickness of the stand. The older the plants become before they are cut, or the thicker the stand, the higher must the cutting be. If a thick stand is allowed to come into full bloom before it is cut, the plants are very likely to be killed (fig. 2).

Because of the difficulties in making the second year's growth into hay, many farmers are successfully ensilaging sweetclover, using the proper amounts of molasses or acid.

Losses From Diseases

Losses of stands of sweetclover during the second year have been of increasing frequency in many sections of the Corn Belt and particularly where it has been used regularly in rotations for 10 to 15 years. A rotting of the new shoots at the soil surface is characteristic of the early dying that may occur in small areas or spread until the entire field may become valueless for grazing. A blackening and distortion of the stems is usually related to dying at the blooming period.

A combination of various diseases appears to be the cause of these troubles, and, as yet, no remedy or resistant varieties are available. When such conditions occur, it is advisable to substitute either red clover or alfalfa once or twice in the rotation before again using sweetclover.

Saving the Seed

Sweetclover matures seed unevenly and shatters readily so that not all the seed can be saved. To get the most seed and the best seed, harvesting should be done when about half of the pods are black. The binder or even a corn binder is often used. The combine is also widely used, and it is particularly adapted to thick stands where the seed is borne high on the branches. Extreme, uneven maturity of the plants, frequently occurring during wet seasons, makes harvesting more difficult. When such conditions prevail sweetclover is often cut and windrowed and the seed afterwards threshed from the windrow. In recent years several farmers have devised and built machines which beat the seed off and leave the stalks standing. These machines are built by installing a heavy reel with four to six bars on an old binder. The machine is so geared that each plant is struck several times as the machine moves forward and the seed is thrown back into a box. The seed must be removed from the box and spread out to dry, and if the weather is damp or the pile of seed deep the seed must be stirred frequently. After drying, the seed is ready to hull.

Between 2 and 5 bushels of seed per acre may be expected, though yields as high as 15 bushels have been harvested.

If the first growth is allowed to seed, the stalks will be very tall and coarse and hard to handle. When a field has been grazed until the last of June or a hay crop has been taken, the second growth is less coarse and the seed ripens more evenly.

U. S. GOVERNMENT PRINTING OFFICE: 1939

For sale by the Superintendent of Documents, Washington, D. C. - - - - Price 5 cents